PHOTOIONIZATION DETECTOR (PID) CHEAT SHEET

The Baltimore County Fire Department carries the following PIDs:

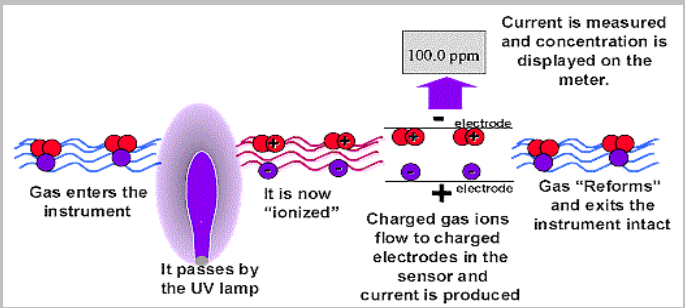
MultiRae Plus - Four gas meter with built in PID
ppbRae - Measures the presence of VOCs in parts per billion
MiniRae - Measures the presence of VOCs in parts per million

What does the PID measure?

* Volatile Organic Compounds: Organic (carbon containing) compounds that have a vapor pressure that results in the material vaporizing and entering the atmosphere. Common VOCs include hydrocarbons, aldehydes, and ketones.
* Other elements and compounds whose IONIZATION POTENTIAL is less than the energy emitted by the PID Bulb

How does the PID detect VOCs?

A Photo Ionization Detector (PID) uses an Ultraviolet (UV) light source ("Photo") to "Ionize" a gas sample and "Detect" its concentration. Ionization occurs when a molecule absorbs the high energy UV light, which excites the molecule and results in the temporary loss of a negatively charged electron and the formation of positively charged ion. The gas becomes electrically charged. These charged particles produce a current that is easily measured. The ions quickly recombine after the electrodes to "reform" their original molecule. Therefore, PIDs are a non-destructive measurement device. (Raesystems.com)



When should a PID be used?

The PID can be used for unknowns, although it will not help identify the type of chemical. It will merely indicate the presence of a VOC.

If a known material is being monitored, you must make sure that the chemical in question can be ionized by the lamp in our PIDs. The key to knowing whether or not your PID can see the sample is to know the **IONIZATION POTENTIAL (IP)** of the chemical.

CONVERSION FACTORS: BCoFD PIDs are calibrated to ISOBUTYLENE. Known chemicals have a conversion factor (CF) that can be used to determine the actual value of material monitored. For example: The CF for Ammonia is 9.7. In a **known** Ammonia environment, multiply the reading on the meter by the CF to determine the actual reading.

Ammonia environment = 100ppm X (CF) 9.7 = 970ppm Ammonia in environment

Refer to a PID Conversion Factor Chart for additional CFs

IONIZATION POTENTIALS (IP)

There are two types of lamps used in PIDs. They have energy outputs of 10.6 electron volts (eV) and 11.7 eV.

BCoFD PIDs have 10.6 eV lamps.
Translation: The chemical must have an Ionization Potential (IP) less than 10.6 eV to be visible by our PIDs. This value can be found in the NIOSH POCKET GUIDE.

Common Ionization Potentials:

Compounds our PID CAN see (IP less than 10.6 eV)
Acetone = 9.69 eV
Ammonia = 10.18 eV
Benzene = 9.24 eV
Ethyl Alcohol = 10.47 eV
Isopropyl Alcohol = 10.10 eV

Compounds our PID CANNOT SEE
Acetylene = 11.40 eV
Chlorine = 11.48 eV
Hydrogen Cyanide = 13.60 eV
Hydrogen Chloride = 12.74 eV
Nitric Acid = 11.95

KPH 2007